

## CLAIMS

What is claimed is:

1. A solar cell comprising:

5 a multijunction solar cell structure including at least one or more epitaxially grown layers on a substrate, and having at least a first, second, and third subcell;

the first photovoltaic subcell having a first photoactive junction monolithically grown above the substrate;

10 the second photovoltaic subcell having a second photoactive junction monolithically grown above the first subcell;

the third photovoltaic subcell having a third photoactive junction created through diffusion of epitaxially grown material into the substrate; and

15 an epitaxially grown diode that is integral to at least a portion of the first subcell.

2. The multijunction solar cell as defined in claim 1, wherein such epitaxially grown diode is electrically connected across at least said first and second cells to protect such first and second cells against reverse biasing.

3. The multijunction solar cell as defined in claim 1, the epitaxially grown diode having a Schottky contact.

4. The multijunction solar cell as defined in claim 1, further comprising a Ge substrate.

- 25 5. The multijunction solar cell as defined in claim 1, further comprising a second subcell fabricated at least in part of InGaP.

6. The multijunction solar cell as defined in claim 1, further comprising a first subcell fabricated at least in part of GaAs.

- 30 7. The multijunction solar cell as defined in claim 1, further comprising a first subcell fabricated at least in part of InGaAs.

8. The multijunction solar cell as defined in claim 1, further comprising at least a third subcell fabricated at least in part of Ge.

9. The multijunction solar cell described in claim 1, wherein said bypass diode is  
5 space qualified to operate in an AM 0 environment.

10. The multijunction solar cell described in claim 1, wherein said diode is about 0.5 to 3.0 microns thick.

10. 11. A solar cell comprising:

a multijunction solar cell structure including at least one or more epitaxially grown layers on a substrate and having at least a first, second, and third subcell;

the first photovoltaic subcell having a first photoactive junction monolithically grown above the substrate;

15 the second photovoltaic subcell having a second photoactive junction monolithically grown above the first subcell;

the third photovoltaic subcell having a third photoactive junction created by diffusion of epitaxially grown material into the substrate; and

20 an epitaxially grown diode having a Schottky contact that is integral to at least a portion of the first subcell.

12. The multijunction solar cell as defined in claim 11, wherein such epitaxially grown diode is electrically connected across at least said at first and second cells to protect such first and second cells against reverse biasing.

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13. The multijunction solar cell as defined in claim 11, further comprising a Ge substrate.

30 14. The multijunction solar cell as defined in claim 11, further comprising a second subcell fabricated at least in part of InGaP.

15. The multijunction solar cell as defined in claim 11, further comprising a first subcell fabricated at least in part of GaAs.

16. The multijunction solar cell as defined in claim 11, further comprising a first subcell fabricated at least in part of InGaAs.

17. The multijunction solar cell as defined in claim 11, further comprising at least a  
5 third subcell fabricated at least in part of Ge.

18. The multijunction solar cell described in claim 11, wherein said bypass diode is space qualified to operate in an AM 0 environment.

10 19. The multijunction solar cell described in claim 11, wherein said diode is about 0.5 to 3.0 microns thick.

20. A solar cell comprising:

a multijunction solar cell structure including at least one or more epitaxially grown layers on a substrate and having at least a first, second, and third subcell;

15 the first photovoltaic subcell having a first photoactive junction monolithically grown above the substrate;

the second photovoltaic subcell having a second photoactive junction monolithically grown above the first subcell;

20 the third photovoltaic cell having a third photoactive junction created by diffusion into the substrate; and

an epitaxially grown diode having a lateral conduction layer.

21. The multijunction solar cell as defined in claim 20, wherein the lateral  
25 conduction layer is comprised of highly doped n<sup>+</sup>-GaAs.

22. The multijunction solar cell as defined in claim 20, wherein the lateral conduction layer is comprised of InGaAs.

30 23. The multijunction solar cell as defined in claim 20, further comprising a Ge substrate.

24. The multijunction solar cell as defined in claim 20, further comprising a second subcell fabricated at least in part of InGaP.

25. The multijunction solar cell as defined in claim 20, further comprising a first subcell fabricated at least in part of GaAs.

5        26. The multijunction solar cell as defined in claim 20, further comprising a first subcell fabricated at least in part of InGaAs.

10        27. The multijunction solar cell as defined in claim 20, further comprising at least a third subcell fabricated at least in part of Ge.

15        28. The multijunction solar cell defined in claim 20, wherein said bypass diode is space qualified to operate in an AM 0 environment.

20        29. The multijunction solar cell defined in claim 20, wherein said diode is about 0.5 to 3.0 microns thick.

25        30. The multijunction solar cell defined in claim 20, wherein said GaAs lateral conduction layer is about 0.1 to 2.0 microns thick.

30        31. A monolithic diode integral to a multijunction solar cell comprising:  
            a Schottky contact and a structure comprised of at least a GaAs buffer layer,  
            an InGaP contact layer, and a lateral conduction layer.

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